from this project are not anticipated. However, best management practices will be implemented during the construction and post-construction phases of this project to minimize any infiltration of surface contaminants to ensure the greatest level of protection to groundwater quality.

If future investigations reveal that construction activities along the chosen Alternate will encounter contaminated soils and groundwater, the applicable waste disposal, dewatering, and effluent discharge rules and regulations will be followed and the proper permits will be obtained. This will serve to protect groundwater quality. Accidental spills will be cleaned up according to the regulatory requirements. The soil erosion/sedimentation and stormwater management plans developed for this project will include measures designed to minimize the likelihood of infiltration. As additional site-specific geotechnical data are collected during advanced designs of the chosen Preferred Alternate (Alternate 2), the occurrence of conditions vulnerable to contamination from project related activities would be more clearly identified. In these cases, measures will be implemented to limit infiltration. All disturbed contaminated soil or groundwater that is contaminated above the regulatory limits will be managed and disposed of according to all state and federal laws and regulations to ensure protection of human health and the environment.

4.6.2 Biological Resources

4.6.2.1 Cover Types/Habitat

4.6.2.1.1 Cover Types

The Preferred Alternate (Alternate 2) will impact approximately 1,127.21 hectares (2,785.30 acres) of land. The range of impacts for the alternates is between 1,094 hectares (2,704 acres) of land (Alternate 12) and 1,200 hectares (2,965 acres) (Alternate 4) (see Table 4-38). The majority of the cover types that would be converted to roadway use by each Alternate consist of agricultural land (cropland), pasture, and hayfield. Combined with developed land, these cover types affect between 81 percent (Alternate 12) to 89.6 percent (Alternate 4) of the total affected area. These cover types represent disturbed areas that typically have a low diversity of native plant species. The major cover types important to wildlife affected by all of the Alternates include upland forest and wetlands (Section 4.9). There are patches of native grassland but these areas are too small to have much wildlife value. The plant communities within each individual area mapped (Exhibits) along the alignments show signs of varying levels of past disturbance that has affected the species composition (native vs. non-native) and diversity.

Upland Forest:

Upland forest impacts vary from 97.9 hectares (241.9 acres) in Alternate 6 to 123.9 hectares (306.2 acres) in Alternate 7 (Table 4-38). Acreage of upland forest loss by Alternate is given in Table 4-38. Most of the impacts to forest occur between Galena and Elizabeth (Sections AB, BC, BD and BF), as shown in Table 4-39. Of the approximately 4,100 hectares (18,800 acres) of upland forest in the project corridor, the Preferred Alternate (Alternate 2) will impact 110.7 hectares (273.5 acres) of upland forest. The forested areas are generally dominated by oaks, hickories and maples, depending on slope and past history. These areas also vary in age, presence/absence of shrub/sapling layers, and type and intensity of disturbance.

One area (see Exhibits, sheets 25 and 26) contains a forested area that is approximately 158 hectares (390 acres) in size. The forest is characterized as a mesic oak-maple hardwood. Section B-F of Alternates 1 and 2 will impact approximately 19 hectares (47 acres) of this

TABLE 4-38
SUMMARY OF COVER TYPES AFFECTED BY EACH ALTERNATE

	Alternate (Acres)											
Cover Type	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Agricultural Land	1,503.10	1,523.10	1,764.50	1,784.50	1,757.80	1,777.80	1,558.80	1,552.10	1,578.80	1,572.10	1,413.90	1,378.40
Pasture	702.7	694.9	635.3	627.5	649.8	642.0	635.7	650.2	627.9	642.4	614.6	635.2
Upland Forest	274.2	273.5	259.1	258.4	242.6	241.9	306.2	289.7	305.5	289.0	304.3	304.1
Hayfield	170.5	170.5	179.5	179.5	137.0	137.0	228.3	185.8	228.3	185.8	161.6	169.5
Developed Land	66.2	70.1	68.8	72.7	71.8	75.7	82.0	85.0	85.9	88.9	176.5	151.2
Unmapped	25.4	25.4	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	33.9	21.5
Fence Row	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8		
Shrubland	4.8	4.8	6.8	6.8	6.8	6.8	6.9	6.9	6.9	6.9	6.0	7.9
Floodplain Forest	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	10.8	10.8
Non-native Grassland	3.2	3.2	4.0	4.0	4.0	4.0	9.4	9.4	9.4	9.4	26.2	22.2
Forbland	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Native Grassland	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Tree Plantation											0.7	0.7
Total Acres	**2,760.90**	**2,785.30**	**2,949.90**	**2,965.30**	**2,901.70**	**2,917.10**	**2,859.20**	**2,811.00**	**2,874.60**	**2,826.40**	**2,751.10**	**2,704.10**
Total Hectares	**1,117.34**	**1,127.21**	**1,193.82**	**1,200.06**	**1,174.32**	**1,180.55**	**1,157.12**	**1,137.61**	**1,163.35**	**1,143.84**	**1,113.37**	**1,094.35**

Note: Total cover type impacts are presented in both metric and English units.
The Preferred Alternate is highlighted.
Source: The Louis Berger Group, Inc., 2002.

TABLE 4-39
UPLAND FOREST IMPACTS BY ALTERNATE AND SECTION

Alternate	AB hectares (acres)	BC hectares (acres)	BD hectares (acres)	BF hectares (acres)	CD hectares (acres)	CI hectares (acres)	DE hectares (acres)	EF(N) hectares (acres)	EF(S) hectares (acres)	FG hectares (acres)	GH(N) hectares (acres)	GH(S) hectares (acres)	HJ hectares (acres)	IJ hectares (acres)	IK hectares (acres)	JK hectares (acres)	Total hectares (acres)
Alternate 1	58.8 (140.3)			47.0 (116.1)						0.4 (0.9)	0.8 (1.9)		3.1 (7.7)			3.0 (7.3)	111.0 (274.2)
Alternate 2	58.8 (140.3)			47.0 (116.1)						0.4 (0.9)		0.5 (1.2)	3.1 (7.7)			3.0 (7.3)	110.7 (273.5)
Alternate 3	58.8 (140.3)		29.7 (73.5)				0.4 (0.9)		10.8 (26.6)	0.4 (0.9)	0.8 (1.9)		3.1 (7.7)			3.0 (7.3)	104.8 (259.1)
Alternate 4	58.8 (140.3)		29.7 (73.5)				0.4 (0.9)		10.8 (26.6)	0.4 (0.9)		0.5 (1.2)	3.1 (7.7)			3.0 (7.3)	104.6 (258.4)
Alternate 5	58.8 (140.3)		29.7 (73.5)				0.4 (0.9)	4.1 (10.1)		0.4 (0.9)	0.8 (1.9)		3.1 (7.7)			3.0 (7.3)	98.2 (242.6)
Alternate 6	58.8 (140.3)		29.7 (73.5)				0.4 (0.9)	4.1 (10.1)		0.4 (0.9)		0.5 (1.2)	3.1 (7.7)			3.0 (7.3)	97.9 (241.9)
Alternate 7	58.8 (140.3)	47.3 (116.9)			1.5 (3.7)		0.4 (0.9)		10.8 (26.6)	0.4 (0.9)	0.8 (1.9)		3.1 (7.7)			3.0 (7.3)	123.9 (306.2)
Alternate 8	58.8 (140.3)	47.3 (116.9)			1.5 (3.7)		0.4 (0.9)	4.1 (10.1)		0.4 (0.9)	0.8 (1.9)		3.1 (7.7)			3.0 (7.3)	117.2 (289.7)
Alternate 9	58.8 (140.3)	47.3 (116.9)			1.5 (3.7)		0.4 (0.9)		10.8 (26.6)	0.4 (0.9)		0.5 (1.2)	3.1 (7.7)			3.0 (7.3)	123.6 (305.5)
Alternate 10	58.8 (140.3)	47.3 (116.9)			1.5 (3.7)		0.4 (0.9)	4.1 (10.1)		0.4 (0.9)		0.5 (1.2)	3.1 (7.7)			3.0 (7.3)	116.9 (289.0)
Alternate 11	58.8 (140.3)	47.3 (116.9)				16.0 (39.6)									3.0 (7.5)		123.2 (304.3)
Alternate 12	58.8 (140.3)	47.3 (116.9)				16.0 (39.6)								0.0 (0.0)		10.3 (7.3)	123.1 (304.1)

Source: The Louis Berger Group, Inc., 2002

Note: The Preferred Alternate is highlighted.

forested area. Section B-D of Alternates 3 through 6 and Section B-C of Alternates 7 through 12 will impact approximately 19.4 hectares (48 acres) and 23.6 hectares (58.3 acres), respectively.

An additional area (see Exhibits, Sheet 14), encompassing the 105 hectare (259 acre) Tapley Woods Land and Water Reserve, contains approximately 243 contiguous hectares (600 acres) of mesic oak-maple hardwood forest. Section BC of Alternates 7 through12 will pass through the extreme southern portion of this forest area and impact approximately 2.08 hectares (5.13 acres). None of these impacts will directly affect the Tapley Woods Land and Water Reserve.

The Department will mitigate the loss of upland forest. Proposed mitigative measures as discussed in Section 4.15.

Native Grassland:

Of the approximately 38 hectares (93 acres) of Native Grassland (Table 2-22) in the project corridor, 1.6 hectares (3.9 acres) will be impacted (Table 4-38) by any one of the twelve Alternates. All Native Grasslands being impacted occur within the common segment to all of the Alternates, AB. Prairie Site 1 will be impacted by all Alternates. This site consists of two areas totaling 5.4 hectares (13.4 acres) in size. The smaller, more northerly prairie area will be impacted (see Exhibits, Sheet 5). This dolomite hill prairie is dominated by little bluestem and eastern red cedar. Approximately 0.4 hectare (1.0 acre) occurs within the proposed right-of-way and will be considered impacted by the project.

4.6.2.2 Wildlife Resource Impacts

Wildlife impacts were assessed from the standpoint of construction impacts and subsequent use of the proposed highway. Construction of any one of the proposed Alternates will result in impacts to wildlife through the loss and alteration of existing vegetation and habitat. Construction impacts to wildlife have been assessed in terms of the acreage of habitat directly impacted by each alternate (Table 4-38). This includes the fragmentation and isolation of existing habitat, the disruption of wildlife movement, and the mortality of individual wildlife species during construction and subsequent roadway use (vehicle-wildlife crashes). These impacts will mostly occur to wildlife species that are common within the project area. Potential impacts to common wildlife species is anticipated to be higher for the Freeway Alternates than the Expressway Alternates since the latter closely follow the existing U.S. Route 20 corridor, whereas the Freeway Alternates will result in the construction of new roadway through mostly open country while the existing U.S. Route 20 would remain intact.

4.6.2.2.1 Habitat Loss

Loss of wildlife habitat can be measured through estimates of cover type losses that support wildlife. Construction of an alternate will result in the loss or conversion of several cover types within the right-of-way that support various wildlife species (Table 4-38). Upland and floodplain forests, wetlands, and prairies are the more valuable and least impacted habitats within the project area. The alternates do not vary substantially in the number of impacted hectares of these habitats. Each alternate will impact a large percentage (>80 percent) of agricultural land, hayfield, and pasture which generally have a lower value as wildlife habitat. The Preferred Alternate (Alternate 2) and Alternate 1 will impact the least amount of habitat.

The most notable areas of wildlife habitat in proximity to the Alternates include the upland forests in and surrounding Tapley Woods, the extensive wetland areas along Irish Hollow Creek, and the river corridors along the Galena River, Apple Rivers and Yellow Creek.

4.6.2.2.2 Habitat Fragmentation

Fragmentation of forests or other large cover types is defined as the division of large areas into smaller ones. The division of large forest habitats into smaller areas generally reduces their value to wildlife, particularly bird species. Many species of forest birds require large blocks of habitat, avoid habitat edges, or do not nest successfully near edges. Populations of these species generally do poorly in areas where habitat is broken into small, isolated blocks, a process called "habitat fragmentation". The bird species are often called "area-sensitive" species.

Nest predation is a serious problem for many species. In Illinois, nest predators may destroy as many as 80 percent of all nests for some species of woodland birds. Many potential nest predators, such as foxes, raccoons, skunks, opossums, blue jays and crows are attracted to small woodlots or travel along woody edges. These predators destroy the nests or young of birds breeding in small woodlots or near the edges of large forests. Edge-enhanced nest predation has been recorded to extend more than 100 meters (110 yards) into some forests.

In addition, nest parasitism by the brown-headed cowbird is also a serious problem for many bird species. Cowbirds lay their eggs in the nests of other birds, which incubate the eggs and raise the cowbird young as their own. Cowbirds reduce host nest success because they often remove a host egg before laying one of their own, and their eggs hatch 1-3 days earlier than the hosts. Additionally, cowbird nestlings are larger and grow faster than host young, which results in the cowbird young receiving the majority of food and parental care from the foster parents (Herkert et al 1993).

Female cowbirds prefer wooded edges and small woodlots for finding host nests and can lay up to 77 eggs a season. Cowbird numbers have increased greatly as a result of several factors, including fragmentation.

Highway construction may compromise foraging habitat and impede wildlife movement through forested corridors. New woodland edges created by the highway may experience tree loss due to drying effects of the sun, wind and exposure to pollutants. Some woodland edges may become unsuitable for wildlife because of increases in noise and highway activity.

Fragmentation of habitats is often a concern for roadways constructed on new alignments. The largest, most contiguous forested areas are present in the Tapley Woods Conservation Area. Sections BC, BD and BF, common to one or more of the Alternates, will fragment an approximately 158 hectare (390 acre) upland forest located just west of the Tapley Woods Land and Water Reserve. Approximately 10.5 hectares (26 acres) of interior forested area will be lost and approximately 6300 linear feet of edge would be created. These impacts will result in the loss of Neotropical migrant and bird-breeding habitat. The resulting edge effects will allow predation and nest parasitism to penetrate approximately 300 feet further into the forests. Area sensitive breeding birds such as vireos, ovenbirds, thrushes and warblers would be affected. Other woodland dependent birds such as hawks and owls will be affected by the loss of available habitat, however, because of the larger home range associated with predatory bird species, and the loss of only relatively narrow corridors within these established forests, only a minor negative impact is expected. Likewise, transient bird species will not be appreciably affected by the construction a new roadway. Certain buteos, such as red-tail hawks, frequently utilize highway right-of-ways for hunting and will adapt to using the available habitats within the right-of-way.

Alternates 1 and 7 to 12 would have similar effects as the Preferred Alternate (Alternate 2). Alternates 3 to 6 (Irish Hollow alignments) will have lesser impacts (see Land Cover Mapping, Appendix O).

The Department will provide mitigation for these impacts through the establishment of additional upland forest within the project area. The mitigative measures are discussed in more detail in Section 4.15.

4.6.2.2.3 Barriers to Movement

A wildlife movement (or dispersal) corridor has been defined as a linear habitat the primary function of which is to connect two or more significant areas of habitat (Harris and Gallagher 1989). Linear habitats, such as fence rows, rights-of-ways, and stream corridors provide habitat for resident animals. A corridor may be used by resident individuals, but it must be used by animals for travel (through their home ranges), dispersal, or migration. No such corridors were identified within the project area for white-tailed deer. It is expected that most movement of wildlife in the project area is by using stream corridors and drainage ways. The construction of a highway through a corridor could restrict the movements of some animals and might lead to an increase of roadkill as individuals attempt to move along the corridor.

The Department initially attempted to identify important wildlife corridors within the project corridor. Due to the absence of multiple significant or protected habitats linked by a corridor, no specific important wildlife corridors could be identified. The Department also examined records of reported whitetail deer-vehicle collisions along the length of U.S. Route 20 in Jo Daviess and Stephenson Counties. The deer-vehicle collision data does not indicate concentrated locations of deer-vehicle collisions that would suggest a particular area is serving as a wildlife corridor.

Wildlife movement within the project area probably occurs over shorter distances along abandoned railroad grades and riparian areas along stream corridors. As noted above, the forested ridges and slopes and open pastures within the Tapley Woods area will be fragmented by one or more section of each alternate. The construction of any one of the proposed alternates will affect the movement patterns of larger mammals such as whitetail deer, red and grey fox, bobcat and coyote within this area. The construction of a highway through a wildlife corridor will lead to an increase in wildlife collisions with vehicles.

Between Smallpox Creek and Furnace Creek, the Preferred Alternate traverses 11 kilometers (6.86 miles) of rugged terrain. The roadway will alternate between cut and fill areas. In this length of roadway there will be 19 fill areas (5,121 linear meters (16,800 linear feet)), 18 cut areas (5,212 linear meters (17,100 linear feet)) and one area (640 linear meters (2,100 linear feet)) of at grade. The fills will range from 1.8 to 24 meters (6 to 80 feet) in depth and the cuts will range from 1.2 to 27 meters (4 to 90 feet) in depth. This section of proposed roadway lies just north of Tapley Woods Conservation Area (see Exhibits, Sheets 10, 11, 25 to 28) and parallels Long Hollow. This series of cuts and fills could potentially have an impact on the movement of wildlife in and out of the Tapley Woods Conservation Area. Generally, wildlife movements (deer, opossum, raccoon, fox, bobcat, etc.) are expected to occur down the drainage ways to Long Hollow Creek. Of the 19 fill areas, 7 are proposed to be culverted and one bridged (intermittent tributary to Long Hollow Creek).

Bridged stream and river crossings will maintain several potential wildlife movement corridors within the project area. An equal number of these crossing are proposed for each Alternate. In addition, culverts will be incorporated into the design of the Preferred Alternate to specifically accommodate wildlife passage. The mitigative measures are discussed in more detail in Section 4.15.

4.6.2.2.4 Operational Mortality

Impacts to wildlife populations due to vehicle collisions are a potential consequence of the project. The majority of wildlife/vehicle collisions would involve common wildlife species such as whitetail deer, raccoon, Virginia opossum, gray squirrel, skunk, and several more common bird species. Bobcats, suspected of occurring within areas of suitable habitat (Tapley Woods area), are less likely to be involved in vehicle-wildlife collisions since they tend to shy away from areas of human activity. These animals are primarily nocturnal and would be active during periods of reduced traffic volumes.

Deer collision data along existing U.S. 20 from 1990 to 2000 indicates that the number of crashes average 46.3 per year. The results of a year long study of vehicle/wildlife collisions along a 23 mile stretch of roadway in the Illinois River Valley (Green and Larsen, 2002) indicated the loss of raccoons (220), squirrels (61), opossum (57), frogs (34), birds 28), deer (190), snakes (11) and turtles (10). Recent studies by the U.S. EPA and the Highway Safety Information System (HSIS) indicate that wildlife/vehicle collisions have steadily increased over a 7-year period. The HSIS study, which included data from Illinois, also found that wildlife/vehicle collisions were greater on 2-lane roads, followed by multi-lane rural and urban road types. The study reported collision rates of 0.07 to 1.16 collisions per kilometer per year (Hughes and Saremi 1994).

If the data presented in the HSIS study hold true, conversion of sections of the existing 2-lane U.S. Route 20 to a multi-lane roadway under the Expressway Alternates (Alternates 11 and 12) would result in a reduction in wildlife/vehicle collisions for some road segments. The Freeway Alternates (Alternates 1 through 10) would most likely result in an increase in wildlife/vehicle collisions due to an increase in lane miles along a new corridor and the continued operation of a 2-lane U.S. Route 20. However, it is not known whether the rates of vehicle/wildlife crashes will increase significantly beyond current levels. It is likely that a slight rise in the number of wildlife/vehicle collisions will occur with the increase in lane miles and traffic levels anticipated in the future.

Additional impacts to some wildlife species will be caused by the noise created by vehicles during construction and subsequent roadway operation. Generally, the subsequent use and maintenance of the roadway will reduce the value of adjacent habitat, even in areas where vegetation will not be removed and where it will be replanted. However, many wildlife groups such as small mammals, birds, and deer readily adapt to new noise levels and patterns of activity. Studies have shown that the introduction of roadway noise can cause a varying degree of reduction in breeding bird densities within 250 meters (820 feet) of a roadway (Reijnen et al. 1995). The most adverse noise impact will be during construction due to the initial disturbance of natural areas and the noise levels produced by construction equipment; however, these impacts will be short-term.

The Department will provide mitigation for these impacts through the incorporation of wildlife underpasses along the proposed roadway. The mitigative measures are discussed in more detail in Section 4.15.

4.6.2.2.5 Construction Impacts

Construction activities that will affect wildlife within the project corridor include the clearing of vegetation, vehicle movement, and construction activities and blasting associated with rock cuts.

Mortality of small rodents and herpetofauna are expected to occur during the construction of the roadway, however, the populations of these animals are expected to recover quickly based on their natural fecundity and the abundance of habitat for these species. Avifauna and larger wildlife species such as whitetail deer, fox, and coyote, will also experience a loss of habitat and likewise a loss of individuals through a reduction in the carrying capacity of available habitats. This effect would be more pronounced within the avifauna community. However, considering the small amount of habitat affected the loss of individual wildlife and habitat should not have a significant affect on existing wildlife populations.

4.6.2.3 Threatened and Endangered Species

Within the project corridor, only one state-listed species of wildlife has the potential to be impacted by the proposed project. The state-endangered timber rattlesnake was identified in the project corridor. Timber rattlesnakes move away from their den sites in spring and back to them in the fall. It has been recommended (Brown 1993; Phillips 1999) that an area 2.4 km (1.5 miles) in radius around a den should be safeguarded to protect a viable population of timber rattlesnakes. In addition, a buffer zone of 1.6 km (1.0 mile) beyond this is recommended where some human incursion is allowed. These alignments do encroach upon the buffer zone depicted on Figure 2-12.

The Preferred Alternate could potentially cause the killing of snakes during construction and the new roadway could act as a barrier to snake movement through its habitat, and cause the loss of additional snakes through collisions with vehicles. The Department will attempt to minimize these potential impacts by incorporating wildlife underpasses within this portion of the alignment to allow snakes to cross beneath the roadway, and by employing a qualified herpetologist to determine whether or not the timber rattlesnake is within the right-of-way prior to and during construction.

Based on these considerations, the Preferred Alternative will not impact the timber rattlesnake. The Preferred Alternate (Alternate 2) and other Alternates are not anticipated to affect active den sites for this species. The Preferred Alternate (Alternate 2), Alternate 1, and Alternates 7-12, which utilize Sections BC or BF, will put the proposed roadway beyond the edge of the range of the timber rattlesnake and over 2.0 miles from any known hibernaculum. Alternates 3 through 6, which utilize the Section BD alignment, would pass closer to the center of the timber rattlesnake's range and within 1,000 feet of a hibernaculum. Therefore, the proximity of the Section BD alignment to existing timber rattlesnake habitat may result in an impact to a population of this species.

4.6.2.4 Invasive Species

The construction of the proposed project will create conditions that may allow for the establishment of populations of invasive/nuisance species of plants that already occur within the project area. All alternatives are expected to have similar impacts. Invasive or nuisance species can establish on the ROW during initial highway construction or afterwards due to maintenance practices. The project is not expected to either introduce or increase invasive/nuisance species of plants.

4.7 Surface Water Resources and Water Quality

4.7.1 Construction Impacts

The Preferred Alternate (Alternate 2) will involve the construction of 34 permanent structures (seven bridge and 27 culverts) over the waterways within the project area. It is anticipated that a maximum 40-foot causeway will be installed adjacent to each proposed bridge location to allow for construction vehicle access. In-stream construction work will include temporary access and dewatering structures. Appropriate measures will be taken to maintain near normal downstream flows and to minimize flooding. Fill will be clean aggregate, and placed in a manner that will not be eroded by expected high flows and will not cause more than minimal adverse effects on aquatic resources. Where possible, culverts will be utilized to minimize the fill material placed and maintain flows. Temporary fill and channel changes will be entirely removed and dredged material returned to its original location, following completion of the construction activity. The affected areas will be restored to the pre-project conditions.

Exposed unconsolidated soils and fill material at construction sites have the potential of being eroded and transported to nearby waterways during a rain event. The delivery of sediment to a surface waterbody and the disturbance of streambank and channel bottom sediments during in-stream construction activities at the sites of stream crossings lead to increases in water column turbidity. Increases in turbidity can impact numerous biotic and abiotic processes within the stream. Light penetration is affected which, in turn, impacts plant photosynthesis. The feeding mechanism of aquatic filter feeding organisms may get clogged. In-stream sedimentation resulting from the increased turbidity could bury bottom dwelling organisms. The chemical constituents associated with these sediments may be released to the water column. The sedimentary particles themselves, the chemical constituents remaining associated with their surfaces, and those released to the water column in dissolved form would then be available for transport downstream. These in-stream impacts, however, will be temporary and limited in areal extent. The increased sediment load transported through the existing infrastructure and subsequent sedimentation is also a maintenance problem which can obstruct the functioning of the structure. Construction activities will also require the removal of riparian vegetation.

In order to minimize these impacts and prevent water quality impacts during construction, temporary and permanent erosion and sediment control measures will be implemented at sites that expose areas of soil to erosion. Control measures appropriate to site specific conditions will be implemented and properly maintained to ensure continued effective operation. These measures will be coordinated with the sequence of construction operation. IDOT has established guidance and procedures to ensure compliance with FHWA regulations on erosion and sediment control and the fulfillment of commitments for erosion and sediment control

associated with regulatory and natural resource agencies. These procedures include a detailed erosion and sediment control analysis. After this analysis, the best temporary and permanent control devices and practices appropriate for the site and project conditions will be selected. This information will be incorporated into design plans and specifications.

In order to minimize impacts to aquatic biota during the construction phase and prevent impacts to water quality, temporary and permanent erosion and sediment control measures will be implemented at sites with areas of exposed soils. Potential impacts to fish will be further reduced by conducting any in-stream work outside of the fish spawning periods, approximately April through July. During construction, the crossing of streams by construction vehicles will be prohibited.

As presented in Table 4-40, each of the 12 Alternates for the project includes 9 to 14 stream crossings. For Alternates 1-10, the proposed crossing of Yellow Creek tributaries B and C will utilize a culvert. For Alternates 11 and 12, a culvert will be used to cross Yellow Creek tributary B. All of the remaining crossings are proposed as bridge structures. The impacts for each crossing will differ due to extent of stream channel modification required to construct each crossing. Attempts will be made during the preparation of design plans to minimize the disturbance to stream channels.

During the construction phase of each of the crossings, it is anticipated that a short-term increase in turbidity levels will result. Increases in sedimentation within watercourses may also occur to some degree. It is anticipated that these increases will be short in duration, limited in areal extent, and limited to the in-stream construction phase. Levels within each stream should revert to background, baseline levels shortly after construction completion. Impacts to aquatic biota, such as clogging of the feeding mechanism of aquatic filter feeders or burying of bottom dwelling organisms due to sedimentation within the stream may be a result.

In general, impacts due to bridged crossings typically occur during the construction phase. Bridged stream crossings typically have little to no effect on the stream hydrology, flow velocity or retention times. Operational impacts that may result include an increase in shading as a result of bridge structures, which may also cause a vegetational shift toward a community dominated by more shade tolerant species. In addition, forested riparian corridors beneath the structures will also be lost.

Culvert crossings have a greater potential to affect stream hydrology, flow velocity or retention times, which may affect rate of erosion and sedimentation patterns. These structures can cause stream constriction and/or stream blockage during storm events. In addition, improperly designed or installed culverts can create an impediment to fish migration. The culvert crossings will be located in Yellow Creek Tributary C (Alternates 1-10) and Yellow Creek Tributary B (Alternates 1-12). The potential for aquatic organisms to move through the stream system will be maintained by installing a culvert that accommodates a low flow channel and is at grade with the natural stream channel.

4.7.1.1 Apple River Crossings

The proposed crossing of the Apple River, a candidate National Wild and Scenic River, will be dual bridges spanning the river and nearby Apple River Road (refer to Sheet 32 in Exhibits). One bridge will carry two eastbound lanes of traffic, and the adjacent structure will carry two westbound lanes of traffic. The proposed dual bridges are each 13.76M (45'-2") wide and estimated to be 8-span structures approximately 371.86M (1,220'-0") in total length. The proposed span lengths are 46.48M (152'-6") center-to-center of the piers. It is anticipated that the substructure units for both bridges will consist of open abutments protected by wire reinforced concrete slopewalls and seven reinforced concrete piers. It is anticipated that the two easternmost piers will extend parallel along each bank of the Apple River straddling the river. These piers may be outside or within the waterway. Final design criteria will determine the exact locations. The remaining five piers west of the Apple River will likely be within the river's flood plain. It is anticipated that Apple River Road will extend between the far easternmost pier and the east abutment.

The second proposed crossing will also be dual bridges spanning over both the Apple River Tributary and the nearby Becker Road. One bridge will be carrying two eastbound lanes of traffic and the adjacent bridge will be carrying two westbound lanes of traffic (refer to Sheet 32 in Exhibits). The proposed dual bridges are each 13.76M (45'-2") wide and estimated to be six-span structures, approximately 208.48M (684'-0") in total length. The proposed span lengths

TABLE 4-40
COMPARISON OF WATERCOURSE CROSSINGS BY ALTERNATE

Watercourse	Alternate											
	1	2	3	4	5	6	7	8	9	10	11	12
Hughlett Brook	•	•	•	•	•	•	•	•	•	•	•	•
Galena River	•	•	•	•	•	•	•	•	•	•	•	•
Smallpox Creek	•	•	•	•	•	•	•	•	•	•	•	•
Apple River	•	•	•	•	•	•	•	•	•	•	•	•
Furnace Creek (Upper)	•	•	•	•	•	•	•	•	•	•	•	•
Furnace Creek (Lower)	•	•	•	•	•	•	•	•	•	•	•	•
Wolf Creek	•	•	•	•	•	•	•	•	•	•	•	•
Rush Creek	•	•	•	•	•	•	•	•	•	•	•	•
Mud Run	•	•	•	•	•	•	•	•	•	•	•	•
Yellow Creek	•	•	•	•	•	•	•	•	•	•	•	•
Yellow Creek (tributary A)	•	•	•	•	•	•	•	•	•	•	•	•
Yellow Creek – (tributary B)	✚	✚	✚	✚	✚	✚	✚	✚	✚	✚	✚	✚
Yellow Creek (tributary C)	✚	✚	✚	✚	✚	✚	✚	✚	✚	✚	•	•
Unnamed Tributary of Pecatonica River	•	•	•	•	•	•	•	•	•	•	•	•
Unnamed Tributary Waddam's Creek	•	•	•	•	•	•	•	•	•	•	•	•
TOTALS	14	14	13	13	13	13	13	13	13	13	9	10

•Bridged Water Crossing ✚Culverted Water Crossing

* The Preferred Alternate is highlighted.
Source: The Louis Berger Group, Inc., 2002.

vary from 40.08M (131'-6") to 28.04M (92'-0") center-to-center of the piers. It is anticipated that the substructure units for both bridges will consist of open abutments protected by wire reinforced concrete slopewalls and five reinforced concrete piers. It is likely that the second western pier will be within the channel limits, while the remaining four piers may be within the floodplain. Becker Road will extend between the fourth and fifth piers.

It is not anticipated that rip-rap will be required around the concrete piers of either crossing. The pier foundations will be designed to support all estimated loads and have a foundation type and depth that will protect the structure against scour. The exact foundation requirements will be determined following a geotechnical investigation with soil borings around the proposed pier locations. Depending upon the river conditions at the time of construction, cofferdams may be required. The final overall bridge lengths, number of spans, number and types of substructure units will be determined during the final design phase. The bridges will be designed to avoid and minimize impacts to the scenic and recreational values of the Apple River.

4.7.2 Operational Impacts

Vehicles, dustfall, and precipitation are the major sources of pollutants that accumulate on roadway surfaces, median areas, and adjoining rights-of-way during operation and that are constituents of highway stormwater runoff (FHWA 1996). FHWA-sponsored research has demonstrated the key factor in highway runoff pollutant loadings is impervious surface area (FHWA 1990).

Studies by the FHWA indicate that pollutants in highway runoff are not present in amounts sufficient to threaten surface water or groundwater quality where the average daily traffic (ADT) is less than 30,000. In general, urban highways, with greater than 30,000 vehicles per day, were found to produce runoff with two to five times the pollutant levels present in runoff from rural highways. Recent research by FHWA (RD-88-006-9) concluded that paved rural roadways with ADT under 30,000 had only minor impacts, if any, on the water quality of the receiving waters. The proposed Alternates have a projected ADT ranging from 11,600 to 20,000 in the year 2020.

As discussed in Section 2.0, the IEPA has assessed surface water quality in the project area. IEPA Use Assessment criteria indicate that most of the streams in the project area are in Full Use. The impact of existing roadway runoff to existing surface water quality in project area watersheds is small and not adverse. It is not anticipated that increases in impervious surface area due to the proposed project will adversely impact surface water quality.

Although adverse impacts to surface water quality are not expected, features are incorporated into the roadway design that will reduce stormwater runoff loadings. Proposed designs include grassed medians and roadside ditches. These features will reduce pollutant loadings to nearby waterways. Pollutant removal in vegetated swales occurs through filtration by vegetation, deposition of particulate matter in low velocity areas, and infiltration through surface soils (FHWA 1996). Sedimentation of suspended material is the primary mechanism of removal. Thus, suspended solids and metals adsorbed into particulate matter are most effectively removed. FHWA (1996) states that, in general, a well-designed, well-maintained grassed swale system can remove 70 percent total suspended solids, 30 percent total phosphorus, and 50 to 90 percent trace metals.

4.7.3 Maintenance Impacts

4.7.3.1 Deicing Salt

Deicing salt, along with plowing and sanding, are seasonal tools for highway snow and ice control. Deicing salt produces important public mobility and safety benefits by rapidly and reliably providing more drivable and less hazardous road conditions during the winter months.

Surface runoff is the primary mode of road salt removal. Runoff from the roadway and adjacent right-of-way is directed to the highway drainage system before outletting into a stream. Potential impacts of deicing salt from highway runoff include effects on stream water quality and aquatic biota.

Deicing salt usage in the project area varies from year to year, depending on the number, length and intensity of winter storms. As depicted in Table 4-41, over a ten-year period (1992-2001), the average annual deicing salt usage in Jo Daviess County was 8,955 kg/lane-km (15.9 tons/lane-mile). The range varied from 15,291 kg/lane-km (27.1 tons/lane-mile) (2000) to 4,837 kg/lane-km (8.6 tons/lane-mile) (2001). The ten-year average annual salt usage in Stephenson County was 8,779 kg/lane-km (15.6 tons/lane-mile) and ranged from 13,594 kg/lane-km (24.1 tons/lane-mile) (1996) to 4,835 kg/lane-km (8.6 tons/lane-mile) (2001).

Water quality data for area streams indicated that the existing annual chloride levels of the streams in the project area range from 5 to 50 parts per million (ppm). Seasonal chloride fluctuations for area streams include the Galena River (10-20 ppm), Apple River (14-20 ppm), Hewlett Branch (5-10 ppm), Smallpox Creek (11-14 ppm), Furnace Creek (9-12 ppm), Wolf Creek (14-20 ppm), Rush Creek (15-20 ppm), Yellow Creek (25-35 ppm), and an unnamed tributary to the Pecatonica River (28-50 ppm). The state water quality standard for chloride is 500 ppm (see Table 2-20 in Section 2).

The proposed project would increase the number of lane-miles in the project area, thereby increasing the total salt loading over current levels. This would result in an increase in the delivery of chloride ions to the streams in the project area. This increase would range from 3 to 22 ppm, depending on the stream size and the intensity and frequency of winter storm events.

These impacts are considered seasonal and should not create violations to state water quality standards (chloride and aquatic life).

4.7.3.2 Herbicides

Operational impacts also include the application of herbicide. The herbicides Tordon 101, Garlon 34, and Vanquish are currently used for control of noxious and nuisance weeds. These herbicides are used for spot spraying applications. Only one type of herbicide is actually applied to any given spot within a year.

Impacts caused by weed spray applications are considered minor. Spraying is not allowed at stream crossings, ponds or other water bodies crossing or adjacent to the highway right-of-way.

Spraying is prohibited within 150 feet of a state listed Natural Area or an occurrence of threatened or endangered species. Areas proposed for weed spraying are coordinated with the Illinois DNR.

TABLE 4-41. DEICING SALT USEAGE

	JoDaviess County			Stephenson County		
Fiscal year	Salt Quantity-Kg *(Tons)*	Lane Kilometers *(Miles)*	Salt Kg/Lane Km *(Tons/Lane Mile)*	Salt Quantity-Kg *(Tons)*	Lane Kilometers *(Miles)*	Salt Kg/Lane Km *(Tons/Lane Mile)*
1992	3,989,798 *4398*	346 *215*	11,531 *20.5*	4,548,624 *5014*	404 *251*	11,260 *20.0*
1993	2,035,723 *2244*	346 *215*	5,883 *10.4*	2,712,482 *2990*	404 *251*	6,715 *11.9*
1994	2,143,678 *2363*	346 *215*	6,195 *11.0*	3,538,020 *3900*	404 *251*	8,759 *15.5*
1995	2,966,494 *3270*	346 *215*	8,573 *15.2*	3,280,380 *3616*	404 *251*	8,121 *14.4*
1996	4,386,238 *4835*	346 *215*	12,677 *22.5*	5,491,189 *6053*	404 *251*	13,594 *24.1*
1997	2,528,324 *2787*	346 *215*	7,307 *13.0*	2,460,285 *2712*	404 *251*	6,091 *10.8*
1998	2,364,123 *2606*	346 *215*	6,833 *12.1*	2,353,237 *2594*	404 *251*	5,826 *10.3*
1999	3,606,059 *3975*	346 *215*	10,422 *18.5*	4,396,217 *4846*	404 *251*	10,883 *19.3*
2000	5,290,701 *5832*	346 *215*	15,291 *27.1*	4,729,154 *5213*	404 *251*	11,707 *20.8*
2001	1,673,756 *1845*	346 *215*	4,837 *8.6*	1,953,169 *2153*	404 *251*	4,835 *8.6*
Average	3,098,489 *3,416*	346 *215*	8,955 *15.9*	3,546,276 *3,909*	404 *251*	8,779 *15.6*
Minimum	1,673,756 *1,845*	346 *215*	4,837 *8.6*	1,953,169 *2,153*	404 *251*	4,835 *8.6*
Maximum	5,290,701 *5,832*	346 *215*	15,291 *27.1*	5,491,189 *6,053*	404 *251*	13,594 *24.1*

Sources: Illinois Department of Transportation, 2002; The Louis Berger Group, Inc., 2002.

4.7.4 Permits

Permits include the U.S. Army Corps of Engineers' (Corps) Section 404 permit, IEPA Water Quality Certification, and the IDNR Water Resource Permit. Under Section 404 of the Clean Water Act, the Corps regulates the discharge of dredged and fill material into waters of the United States, including wetlands. The Corps issues either an Individual or a Nationwide permit. An Individual Permit is usually required for potentially significant impacts, whereas Nationwide Permits allow for minor impacts, provided specific conditions to minimize impacts are met. However, for most road crossing discharges with only minimal adverse effects, the Corps often grants an up-front Nationwide Permit 14. Stream crossings that require a Corps' permit and the type of permit required (Individual/Nationwide) are listed in Table 4-42. The IEPA Water Quality Certification provides for the protection of water quality through Section 401 of the Clean Water Act for activities that involve the placement of fill within wetlands and surface waters. The IEPA has provided blanket certification for National Permit 14, but requires individual certification for Individual Section 404 permits and Nationwide Permit 33.

It is anticipated that the project will result in the disturbance of 0.4 or more hectares (one or more acres) of total land area. Accordingly, it is subject to the requirement for a National Pollutant Discharge Elimination System (NPDES) permit for stormwater discharges from the construction sites.

Permit coverage for the project will be obtained either under the IEPA General Permit for Stormwater Discharges from Construction Site Activities (NPDES Permit No. ILR10) or under an individual NPDES permit.

In conjunction with the NPDES Storm Water Permit for Construction Site Activities required for this project, a Storm Water Pollution Prevention Plan will be developed. Such a plan shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater discharges from the construction site. This plan shall describe and ensure the implementation of practices which will be used to reduce the pollutants in discharges associated with construction site activity and to assure compliance with the terms of the permit.

4.8 Floodplains

Streams along the alternates will be crossed by either bridge structures or culverts. Many of these streams have intermittent flows and no FEMA designated floodplains. Some larger streams with perennial flows also do not have FEMA designated 100-year floodplains. The Preferred Alternate (Alternate 2) crosses the Galena River, Smallpox Creek, Furnace Creek, Apple River, Yellow Creek Tributary A, Yellow Creek, Yellow Creek Tributary D (3 encroachments) and Pecatonica River Tributaries (2 encroachments). A summary of the impacts at each crossing location is provided in Table 4-43, and a summary of the impacts by Alternate is provided in Table 4-44. There are no regulatory floodways in the project area. Floodplain boundaries are depicted in Appendices K (Project Area Floodplains Maps with Alternates) and N (Environmental Inventory Maps).

Freeway Alternates 1 and 2 would require 11 crossings of designated 100-year floodplains, and have the lowest estimated total fill volume within the 100-year floodplain (Table 4-44). Freeway Alternates 3 through 10 would require ten crossings of designated 100-year floodplains. Eight of the crossings are common to all Freeway Alternates. Expressway Alternates 11 and 12 would require ten crossings of designated 100-year floodplains, and have the highest estimated total fill volumes within the 100-year floodplain of all the Alternates (Table 4-44). Only three of the crossings are common between the Freeway and Expressway Alternates, which are the Galena River, Smallpox Creek and Apple River.

The floodplains in the project area are mostly agricultural in nature. Cover types within the floodplains are dominated by pasture, hayfield and agricultural land (Exhibits). These cover types provide beneficial floodplain values with regard to agricultural production, some wildlife support, and flood moderation. As storm water tops the banks of a river or stream and spreads out over the floodplain, the flow velocity decreases and the storm peak is reduced. This helps to alleviate the impact of flooding downstream. With the flow velocity decreased the amount of bank erosion also decreases. The floodplains in somewhat natural condition provide nesting and foraging habitat and cover for wildlife.

In accordance with the intent of federal Executive Order 11988 on floodplain management, efforts have been made to minimize floodplain impacts. The longitudinal floodplain encroachments for each alternate are unavoidable. Attempts to minimize the unavoidable longitudinal encroachment impacts are explained below.

In Section H-J (Exhibits, Sheet 94), there are two separate longitudinal encroachments of the Yellow Creek Tributary D floodplain because of locating the Alternate along property lines. The alignment was established to minimize farm severance and disruption to residences and businesses along the entire route. Between stations 4050 and 4575, the proposed alignment shifts to the north to minimize the severance to an existing farm, avoid the farmstead and minimize floodplain impacts. Moving the alignment entirely out of the floodplain would affect the farmstead as well as access to the farmstead from Stees Road. Therefore, the balance between impacts to the farm and farmstead and the encroachment into the floodplain of a tributary to

TABLE 4-42 STREAM CROSSINGS REQUIRING U.S. ARMY CORPS OF ENGINEERS PERMIT

Section	Alternates	Sheet No.	Water Resource	Anticipated Permit
A-B	1-12	3	Hughlett Branch	NW14
A-B	1-12	5	Galena River	NW14
A-B	1-12	6	Unnamed Tributary to Galena River	NW14
A-B	1-12	9	Unnamed Tributary to Small Pox Creek	NW14
A-B	1-12	9	Smallpox Creek	NW14
B-D	3-6	24	Apple River	IND
B-F	1,2	29	Furnace Creek	NW14
B-F	1,2	30	Furnace Creek	IND
B-F	1,2	32	Apple River	IND
C-D	7-10	38	Apple River	IND
C-I	11-12	47	Rush Creek	NW14
C-I	11-12	39	Apple River	NW14
C-I	11-12	53	Yellow Creek Tributary A	IND
C-I	11-12	54	Yellow Creek	IND
C-I	11-12	55	Yellow Creek Tributary B	IND
C-I	11-12	56	Yellow Creek Tributary B	IND
C-I	11-12	58	Yellow Creek Tributary C	NW14
C-I	11-12	59	Yellow Creek Tributary C	IND
C-I	11-12	59	Yellow Creek Tributary C	IND
D-E	3-10	63	Wolf Creek	IND
G-H(N)	1,3,5,7,8	79	Rush Creek	IND
G-H(N)	1,3,5,7,8	82	Mud Run	NW14
G-H(N)	1,3,5,7,8	82, 88	Mud Run	NW14
G-H(S)	2,4,6,9,10	88	Mud Run	NW14
G-H(S)	2,4,6,9,10	92	Yellow Creek Tributary A	NW14
G-H(S)	2,4,6,9,10	79	Rush Creek	IND
G-H(S)	2,4,6,9,10	82	Mud Run	NW14
H-J	1-10	93	Yellow Creek Tributary A	IND
H-J	1-10	94	Yellow Creek	IND
H-J	1-10	96	Yellow Creek Tributary B	NW14
H-J	1-10	97	Yellow Creek Tributary C	NW14
H-J	1-10	99	Tributary to Waddams Creek	NW14
H-J	1-10	99	Tributary to Waddams Creek	NW14
J-K	1-10,12	111	Unnamed Tributary to Pecatonica River	IND

IND – Individual Permit; NW14 – Nationwide Permit 14
Note: The above-referenced sheets are contained in Exhibits.
Source: The Louis Berger Group, Inc., 2002.

TABLE 4-43
FEMA 100-YEAR FLOODPLAIN IMPACTS

Section	Sheet No.	Stream	Embankment Area M^2 (Ft^2)	Piers Area M^2 (Ft^2)	Total Area M^2 (Ft^2)	Approximate Volume of Fill M^3 (Ft^3)	Crossing Type
A-B	5	Galena River	0	162 (1,742)	162 (1,742)	394 (13,914)	Transverse
A-B	9,10	Smallpox Creek	0	81 (871)	81 (871)	123 (4,344)	Transverse
B-D	23,24	Apple River	2,023 (21,780)	243 (2,614)	2,266 (24,394)	6,496 (229,404)	Transverse
B-F	28,29	Furnace Creek	0	121 (1,307)	121 (1,307)	74 (2,613)	Transverse
B-F	30	Furnace Creek	3,440 (37,026)	162 (1,742)	3,602 (38,769)	4,012 (141,682)	Transverse
B-F	32	Apple River	0	202 (2,178)	202 (2,178)	1,541 (54,420)	Transverse
C-D	38	Apple River	445 (4,792)	283 (3,049)	728 (7,841)	4,315 (152,383)	Transverse
C-I	39	Apple River	80 (871)	80 (871)	162 (1,742)	1,036 (36,586)	Transverse
C-I	40	Wolf Creek	3,480 (37,462)	0	3,480 (37,462)	1,590 (56,150)	Longitudinal
C-I	41	Wolf Creek	647 (6,970)	40 (436)	688 (7,405)	333 (11,760)	Transverse
C-I	53	Tributary A to Yellow Creek	1538 (16,553)	40 (436)	1,578 (16,988)	1,233 (43,543)	Transverse
C-I	54,55	Yellow Creek	12,545 (135,037)	40 (436)	12,586 (135,472)	7,545 (266,449)	Transverse
C-I	55	Tributary B to Yellow Creek	971 (10,454)	40 (436)	1,012 (10,890)	1,924 (67,945)	Transverse
C-I	55,56	Yellow Creek	12,262 (131,987)	0	12,262 (131,987)	3,735 (131,900)	Transverse
D-E	61	Wolf Creek	3,642 (39,204)	0	3,642 (39,204)	1,664 (58,764)	Longitudinal
H-J	93	Tributary A to Yellow Creek	1,294 (13,939)	80 (871)	1,375 (14,810)	665 (23,484)	Transverse
H-J	94	Yellow Creek	2,995 (32,235)	202 (2,178)	3,197 (34,413)	1,102 (38,952)	Transverse
H-J	94	Tributary D to Yellow Creek	405 (4,356)	0	405 (4,356)	863 (30,477)	Transverse
H-J	94	Tributary D to Yellow Creek	2,792 (30,057)	0	2,792 (30,057)	1,701 (60,070)	Longitudinal
H-J	94	Tributary D to Yellow Creek	405 (4356)	0	405 (4356)	247 (8,723)	Longitudinal
I-K	108	Unnamed Tributary to Pecatonica River	2,590 (27,879)	0	2,590 (27,879)	1,578 (55,727)	Longitudinal
J-K	114	Unnamed Tributary to Pecatonica River	9,955 (107,158)	0	9,955 (107,158)	6,065 (214,184)	Transverse

Note: The above-referenced sheets are contained in Exhibits.
Source: The Louis Berger Group, Inc., 2002.

TABLE 4-44
100-YEAR FLOODPLAIN IMPACTS BY ALTERNATE

Alternate	Number of Crossings	Embankment Area M^2 (Ft^2)	Piers Area M^2 (Ft^2)	Total Area M^2 (Ft^2)	Approximate Volume of Fill M^3 (Ft^3)
1	11	21,286 (229,120)	808 (8,697)	22,095 (237,829)	15,246 (538,407)
2	11	21,286 (229,120)	809 (8,697)	22,095 (237,829)	15,246 (538,407)
3	10	23,511 (253,070)	768 (8,267)	24,280 (261,348)	19,320 (682,279)
4	10	23,511 (253,070)	768 (8,267)	24,280 (261,348)	19,320 (682,279)
5	10	23,511 (253,070)	768 (8,267)	24,280 (261,348)	19,320 (682,279)
6	10	23,511 (253,070)	768 (8,267)	24,280 (261,348)	19,320 (682,279)
7	10	21,933 (236,085)	808 (8,697)	22,742 (244,793)	17,139 (605,258)
8	10	21,933 (236,085)	808 (8,697)	22,742 (244,793)	17,139 (605,258)
9	10	21,933 (236,085)	808 (8,697)	22,742 (244,793)	17,139 (605,258)
10	10	21,933 (236,085)	808 (8,697)	22,742 (244,793)	17,139 (605,258)
11	10	34,113 (367,189)	483 (5,199)	34,596 (372,388)	19,491 (688,318)
12	10	41,478 (446,466)	483 (5,199)	41,961 (451,664)	23,978 (846,775)

Source: The Louis Berger Group, Inc., 2002.
Note: The Preferred Alternate is highlighted.

Yellow Creek was reached with the proposed alignment. The proposed project is not expected to generate incompatible floodplain development, which is closely regulated by the Jo Daviess County Floodplain Ordinance, the Stephenson County Floodplain Ordinance and various state and local regulations and ordinances.

In Section I-K (Exhibits, Sheet 108) there is a transverse encroachment of the unnamed tributary to the Pecatonica River because of the need to maintain the existing alignment of Ayp Road in this area. Any major shift in the alignment of Ayp Road would result in an adverse impact to several farms located in the immediate vicinity. In Section J-K (Exhibits, Sheet 114) there is also a transverse encroachment of the unnamed tributary to the Pecatonica River. As is the case in Section I-K, the existing alignment of Ayp Road is being maintained in this area to minimize impacts to surrounding agricultural properties. The proposed project is not expected to generate incompatible floodplain development, which is closely regulated by state, county and local regulations and ordinances.

At the Section C-I frontage road (Exhibits, Sheets 39 and 40) and Section D-E frontage road (Exhibits, Sheet 61), the longitudinal impact to the Wolf Creek floodplain is due to the location of the Elizabeth Interchange. One of the goals for the new facility was access to communities. This interchange provides access to Elizabeth that is located to the northeast. Other locations were studied including sites at the intersection of Pleasant Hill Road and the proposed alternates (south of Elizabeth) and the intersection of Madison Road and the proposed alternates (southeast of Elizabeth). Also, different types of interchanges were studied including diamond and trumpet. However, due to the rolling terrain of the area surrounding Elizabeth, these interchanges were not feasible.

The location of the proposed project was also limited in this area. The ground rises quickly from Wolf Creek toward Elizabeth. Placing the roadway further north (towards Elizabeth) would cause the interchange to cut deeply into the ridge and create a larger excavation area. Moving the roadway further north directly impacts many more properties causing residences and farmsteads to be taken or relocated. Locating the roadway south of Wolf Creek would have similar impacts due to the nature of the terrain. The interchange is designed to be very compact, using an offset diamond. This was done to pull the ramps and frontage roads away from Wolf Creek. However, due to the geometric requirements, the frontage road embankments encroach on the floodplain. The proposed project is not expected to generate incompatible floodplain development, which is closely regulated by the Jo Daviess County Floodplain Ordinance, as well as State of Illinois Executive Order 4, permits authorized by the Rivers, Lakes and Streams Act (615 ILCS 5, 1994) and various municipal ordinances.

A hydraulic analysis was conducted to ensure that flood water surface elevations of the crossings proposed by the various alternates would not increase floodplain elevations by more than 0.3 meters (1.0 feet) (Berger, July 2001). In addition, the drainage structures proposed in this project will cause a minimal increase in flood heights and flood limits. These minimal increases will not result in any significant adverse impacts on the natural and beneficial floodplain values; they will not result in any significant change in flood risks or damage; and they do not have significant potential for interruption or termination of emergency service or emergency evacuation routes; therefore, it has been determined that the encroachments are not significant.

Since both Jo Daviess and Stephenson County Floodplain Ordinances are enacted to prevent incompatible floodplain development, none of the proposed project alternates should generate incompatible floodplain development. See pages 4-143 and 4-156 for further discussions of county floodplain ordinances.

Individual Permits from the IDNR Department of Water Resources will be needed for development in floodplains. Individual Permits will be needed for a stream that is located in a rural area and the drainage area for the stream is greater than 2,589.98 hectares (10 sq. miles), a stream that is in urban area and the drainage area of the stream is greater than 258.99 hectares (1 sq. mile), or any channel realignments.

4.9 Wetlands

Impacts to wetlands were identified along each Alternate by overlaying the proposed alignments on the wetland delineation maps. Impacts to wetlands were estimated by digitizing all wetland areas that occur within the project right-of-way.

Wetland impacts from highway construction were assessed for each of the Alternates (Table 4-45). Impacts within the highway right-of-way include vegetation removal, placement of fill, soil compaction, excavation, sedimentation, and changes in wetland hydroperiod and species composition.

The Preferred Alternate (Alternate 2) impacts nine wetlands totaling 1.47 hectares (3.63 acres). Alternate 1 has similar impacts as the Preferred Alternate. Alternates 3, 4, 5 and 6 were also found to be similar, as were Alternates 7, 8, 9 and 10. Alternates 11 and 12 also have similar wetland impacts and are the highest of all the alternates. Table 4-45 presents the direct impacts to each wetland area by alternate and the type of wetland impacted. Table 4-46 presents the impacts to each wetland site by plant community type, Floristic Quality Index, and acreage lost. The wetland sites are depicted in Exhibits.

The Preferred Alternate (Alternate 2) has the least wetland impacts. This Alternate impacts a total of ten wetland sites consisting of four different plant communities. The plant communities consist of four sedge meadows totaling 0.97 hectare (2.40 acres), four wet meadows totaling 0.25 hectare (0.62 acre), one marsh totaling 0.25 hectare (0.61 acre) and one pond totaling 0.01 hectare (0.02 acre). Alternate 1 has similar impacts as the Preferred Alternate. Alternates 11 and 12 impact 26 wetland sites (13 wet meadows, 9 sedge meadows, 3 ponds and 1 marsh) totaling 6.41 hectares (15.84 acres) and 6.33 hectares (15.64 acres), respectively. Alternates 3 to 10 impact 13 to 17 wetland sites totaling between 3.45 hectares (8.53 acres) and 3.62 hectares (8.95 acres). Wetland impacts by alternate, wetland site and plant community are depicted on Table 4-45.

The Floristic Quality Index (FQI) measures a wetland plant community's quality. Wetland plant communities having FQIs over 20 are considered to be environmental assets. Four wetland sites (58, 71, 168 and 209) have FQIs of 20 or higher. The Preferred Alternate impacts one site (209, a sedge meadow) with an FQI of 20. The remaining sites have FQI's between 4.1 and 17.6. The plant community type and wetland sites are depicted in Table 4-46. Alternates 1 and 7 to 10 impact the same wetlands as the Preferred Alternate. Alternates 3 to 6 impact two wetland sites having FQI's greater than 20 (168 and 209), while Alternates 11 and 12 impact three wetland sites having FQI greater than 20 (58, 71 and 209).

The Percent Adventive measures the ratio of native species to exotic (non-native) species in a wetland plant community. The Preferred Alternate impacts wetlands that have an average Percent Adventiveness of 22 percent. This means that almost one out of five species in each wetland site is a non-native species. The range is 4.5 percent to 30 percent. Alternates 11 and 12 have an average Adventiveness of 20.5 and ranges between 3.4 and 77.8.

The majority of wetlands impacted by the alternates consist of wet meadows and sedge meadows. These wetlands are generally located in higher positions of intermittent drainages or first order streams. Many of these areas are within pastures, are subject to grazing and have been degraded. The principal wetland functions associated with these wetland areas include water quality improvement (nutrient transformation and sediment retention), flood flow alteration (flood storage), and wildlife habitat. The effectiveness of each wetland to provide these situations is dependent upon the wetlands size, landscape position and level of disturbance.

A Section 404 permit from the U.S. Army Corps of Engineers (Rock Island District) will be required at each filled wetland site. Generally, wetland impacts greater than 0.5 acres will require an Individual Section 404 permit. Those sites having impacts less than 0.5 acres will qualify for the Nationwide Permit 14 (linear transportation projects). Water quality certification (Section 401) from Illinois EPA will be required at each impacted wetland site.

It is determined that there is no practicable alternative to the proposed construction in wetlands and that the proposed project includes all practicable measures to minimize harm to wetlands which may result from such use.

4.9.1 Measures to Minimize Harm

The Alternate alignments were developed with the goal of avoiding and minimizing impacts to wetlands and stream channels while at the same time meeting the goals of the purpose and need of the project. Wetland impacts have been minimized to the greatest extent possible at this stage of project design in a manner consistent with the project location criteria.

TABLE 4-45
IMPACTS TO WETLANDS BY ALTERNATE

Wetland No.		1	2	3	4	5	6	7	8	9	10	11	12	Wetland Cover Type
120		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	Pond
143		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	Wet Meadow
209		0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	Sedge Meadow
118		0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	Sedge Meadow
168				0.21	0.21	0.21	0.21							Sedge Meadow
178				0.75	0.75	0.75	0.75							Sedge Meadow
164				0.06	0.06	0.06	0.06							Wet Meadow
83		0.03	0.03											Wet Meadow
15												0.06	0.06	Sedge Meadow
17												0.09	0.09	Wet Meadow
20												0.89	0.89	Sedge Meadow
23												0.07	0.07	Wet Meadow
29												0.11	0.11	Wet Meadow
31												0.10	0.10	Wet Meadow
51												0.02	0.02	Wet Meadow
55												0.06	0.06	Marsh
56												0.01	0.01	Wet Meadow
57												0.02	0.02	Pond
58												0.06	0.06	Sedge Meadow
68												0.20	0.20	Wet Meadow
69												0.58	0.58	Sedge Meadow
71												0.12	0.12	Sedge Meadow
79												0.05	0.05	Wet Meadow
185												0.37	0.37	Wet Meadow
83						0.03	0.03		0.03		0.03			Wet Meadow
94						0.04	0.04		0.04		0.04			Pond
83				0.03	0.03			0.03		0.03				Wet Meadow
196				0.01	0.01			0.01						Sedge Meadow
51		0.02		0.02		0.02		0.02	0.02					Wet Meadow
25		0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11			Wet Meadow
24		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02			Sedge Meadow
4		0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		0.10	Wet Meadow
11s				0.79	0.79	0.79	0.79							Wet Meadow
19s				0.15	0.15	0.15	0.15							Sedge Meadow
1s												0.02		Wet Meadow
2s												0.65	0.65	Sedge Meadow
3s												0.05	0.05	Wet Meadow
6s		0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25			Marsh
5s		0.25		0.25		0.25		0.25	0.25					Sedge Meadow
5s			0.25		0.25		0.25			0.25	0.25			Sedge Meadow
10s								1.30	1.30	1.30	1.30	1.30	1.30	Sedge Meadow
17s								0.36	0.36	0.36	0.36	0.36	0.36	Pond
18s								0.42	0.42	0.42	0.42	0.42	0.42	Wet Meadow
Totals	Hectares	1.50	1.48	3.47	3.45	3.50	3.48	3.59	3.62	3.56	3.60	6.33	6.41	
	Acres	3.71	3.65	8.57	8.53	8.65	8.60	8.87	8.95	8.80	8.90	15.64	15.84	

Source: The Louis Berger Group, Inc., 2002.

TABLE 4-46
SUMMARY OF WETLAND IMPACTS BY ALTERNATE

Section	Alternate	Wetland Site	Plant Community Type	Direct Impacts hectares (acres)	FQI
A-B	1-12	118	sedge meadow	0.34 (0.85)	12.9
A-B	1-12	120	pond	0.01 (0.03)	15.6
A-B	1-12	143	wet meadow	0.01 (0.02)	11.7
A-B	1-12	209	sedge meadow	0.36 (0.91)	20.8
B-D	3-6	164	wet meadow	0.03 (0.08)	3.4
B-D	3-6	168	sedge meadow	0.21 (0.53)	20
B-D	3-6	178	sedge meadow	0.75 (1.85)	7.6
B-F	1,2	83	wet meadow	0.03 (0.08)	4.1
C-I	11-12	15	sedge meadow	0.06 (0.14)	12.2
C-I	11-12	17	wet meadow	0.09 (0.23)	4.9
C-I	11-12	20	sedge meadow	0.89 (2.21)	8.1
C-I	11-12	23	wet meadow	0.07 (0.16)	9.1
C-I	11-12	29	wet meadow	0.11 (0.26)	4.5
C-I	11-12	31	wet meadow	0.10 (0.25)	0.7

TABLE 4-46 (CONTINUED)
SUMMARY OF WETLAND IMPACTS BY ALTERNATE

Section	Alternate	Wetland Site	Plant Community Type	Direct Impacts hectares (acres)	FQI
C-I	11-12	51	wet meadow	0.02 (0.04)	6.4
C-I	11-12	55	marsh	0.06 (0.14)	8.6
C-I	11-12	56	wet meadow	0.01 (0.03)	2.3
C-I	11-12	57	pond	0.02 (0.04)	7.4
C-I	11-12	58	sedge meadow	0.06 (0.16)	22
C-I	11-12	68	wet meadow	0.20 (0.49)	10.7
C-I	11-12	69	sedge meadow	0.58 (1.43)	12.7
C-I	11-12	71	sedge meadow	0.12 (0.30)	22.2
C-I	11-12	79	wet meadow	0.05 (0.12)	2.8
C-I	11-12	185	wet meadow	0.37 (0.91)	8.5
E-F(N)	5,6,8,10	83	wet meadow	0.03 (0.08)	4.1
E-F(N)	5,6,8,10	94	pond	0.04 (0.11)	9.2
E-F(S)	3,4,7,9	83	wet meadow	0.03 (0.08)	4.1
E-F(S)	3,4,7,9	196	sedge meadow	0.01 (0.02)	14.2

TABLE 4-46 (CONTINUED)
SUMMARY OF WETLAND IMPACTS BY ALTERNATE

Section	Alternate	Wetland Site	Plant Community Type	Direct Impacts hectares (acres)	FQI
G-H(N)	1,3,5,7,8	51	wet meadow	0.02 (0.04)	6.4
H-J	1-10	24	sedge meadow	0.02 (0.05)	10.1
H-J	1-10	25	wet meadow	0.11 (0.28)	5.7
J-K	1-10,12	4	wet meadow	0.10 (0.24)	10.6
BC	7-12	10s	sedge meadow	1.30 (3.21)	17.1
BC	7-12	17s	pond	0.36 (0.90)	10.7
BC	7-12	18s	wet meadow	0.42 (1.03)	10.7
B-D	3-6	11s	wet meadow	0.79 (1.95)	13.8
B-D	3-6	19s	sedge meadow	0.15 (0.37)	13.7
C-I	11-12	2s	sedge meadow	0.65 (1.61)	14.2
C-I	11-12	3s	wet meadow	0.05 (0.12)	12.2
F-G	1-10	6s	marsh	0.25 (0.61)	13.9
G-H(N)	1,3,5,7,8	5s	sedge meadow	0.25 (0.63)	17.6
G-H(S)	2,4,6,9,10	5s	sedge meadow	0.25 (0.63)	17.6
I-K	11	1s	wet meadow	0.02 (0.05)	12.1

Notes:
1) FQI: Floristic Quality Index: FQI > 20= high quality (native character of plant community)
FQI>10= low quality plant community
FQI<5= disturbed plant community

Source: The Louis Berger Group, Inc., 2002.

Further efforts to minimize wetland impacts will be incorporated into the design and construction of the Preferred Alternate (Alternate 2). These measures may include:

- To the maximum extent possible, existing surface water drainage patterns will be maintained through the installation of pipes and culverts to maintain surface flows to wetland areas;

- Outlets of storm drains will be designed to minimize outlet velocities that might otherwise cause erosion and sedimentation;

- Excavation and filling operations will be conducted in a manner to minimize turbidity and sedimentation in the wetlands and natural water courses. Placement of road embankments (filling) will be conducted in such a manner as to contain sediment at the fill area;

- The limits of the fill activity will be indicated on the final design plans and will be the absolute minimum necessary for the construction of the roadway. The design will meet minimum necessary slopes through wetland areas to minimize fill impacts;

- Equipment storage, temporary roads and stockpile areas will not be permitted within wetlands or adjacent to stream channels; any area proposed for use as a contractor-use-area will require a survey for identification of biological, cultural, and natural resource areas.

- A detailed soil erosion and sediment/stormwater control plan will be developed as an integral part of the construction plans. Emphasis will be given to the prevention of sediments from entering into wetlands and streams. Soil erosion and sedimentation controls will be properly installed and maintained.

4.9.2 Wetland Mitigation

Mitigation for wetland impacts will follow the Department's Wetlands Action Plan as approved by the IDNR under the Illinois Interagency Wetland Policy Act and its implementing regulations. Under the State policy, all wetland impacts must be mitigated. State mitigation ratios are identified in the rules and are determined by the size of impact (over or under 0.5 acres) and the location of the mitigation site (on-site, off-site or out-of-basin).

Wetland mitigation for this project will be carried out by the purchase of the required credits from the Kilbuck Creek Wetland Mitigation Bank site just south of Rockford, Illinois. Bank sites are created specifically for the purpose of wetland mitigation. Wetland banking provides for the consolidation of small wetland impacts into larger parcels, which have more ecological value and are more manageable.

The Kilbuck Creek Bank site occurs within the Rock River Basin, one of the two drainage basins of Illinois in which this proposed project is located. The primary service area of the wetland bank is within Ogle, Winnebago, Boone, and the northern portion of Lee Counties. However, the Corps may, at their discretion, authorize sales of credits for impacts outside the primary geographic service area, at a credit deemed appropriate for the circumstances of the wetland impact.

The Preferred Alternate (Alternate 2) impacts 1.48 hectares (3.65 acres) of wetlands. The applicable mitigation ratios based on the use of the Kilbuck Creek Mitigation bank are 2.0 to 1.0 (sites 4, 24, 25), 3.0 to 1.0 (sites 83, 143 and 120) and 5.5 to 1.0 (sites 118, 209, 5S and 6S).

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